TABLE D

EXAMPLE TYPE	D1 Inv.	D2 Inv.	D3 Inv.	D4 Inv.	D5 Inv.	D6 Inv.
	Inventive Examples-Compositions.					
INORGANIC RAW MATERIALS						
Talc B	—	—	—	—	—	—
Talc C	39.76	39.76	40.23	40.70	40.11	40.70
Talc G	—	—	—	—	—	—
Average of Median Particle Sizes of Talc Sources (μm)	23.2	23.2	23.2	23.2	23.2	23.2
Kaolin A	—	—	8.00	—	—	—
Kaolin B	—	—	—	16.00	15.77	16.00
α-Al_2O_3 B	20.50	20.50	17.65	14.80	—	14.80
α-Al_2O_3 D	—	—	—	—	—	—
α-Al_2O_3 E	—	—	—	—	—	—
$Al(OH)_3$ C	—	—	—	—	15.77	16.00
$Al(OH)_3$ A	—	17.70	16.85	16.00	—	—
$Al(OH)_3$ B	17.70	—	—	—	—	—
Rho alumina	—	—	—	—	16.03	—
Boehmite	—	—	—	—	—	—
Average of Median Particle Sizes of Alumina-Forming Sources (μm)	5.5	8.7	8.8	9.0	12.9	13.9
Quartz A	22.04	22.04	17.27	12.50	12.32	12.50
Quartz B	—	—	—	—	—	—
Quartz C	—	—	—	—	—	—
Average of Median Particle Sizes of Silica Sources (μm)	24.8	24.8	24.8	24.8	24.8	24.8
ORGANIC CONSTITUENTS						
Methyl Cellulose	5.0	5.0	4.0	4.0	4.0	4.0
Sodium Stearate	—	—	1.0	1.0	1.0	1.0
Oleic Acid	0.6	0.6	—	—	—	—
D-162	6.0	6.0	—	—	—	—
SOAK TEMPERATURE (° C.)	1425	1425	1425	1425	1425	1425
SOAK TIME (hours)	25	25	25	25	25	25
FIRED PROPERTIES						
CTE (10^{-7}/° C.) 22–800° C.	5.8	6.9	6.5	6.0	8.3	5.1
Transverse I-Ratio	0.91	0.88	—	—	—	—
Percent Mullite	1.4	1.9	—	—	—	—
Percent Corundum	0.0	0.0	—	—	—	—
Percent Spinel	1.6	2.1	—	—	—	—
Cell Density (cells/in^2)	200	200	200	200	200	200
Wall Thickness (inches)						
Modulus of Rupture (psi)	—	—	—	—	—	—
% Filtration Efficiency	—	—	98.8	—	—	—
Clean Pressure Drop (kPa) at 26.25 scfm flow rate	—	—	2.1	2.2	2.4	2.4

TABLE D-continued

EXAMPLE TYPE	D1 Inv.	D2 Inv.	D3 Inv.	D4 Inv.	D5 Inv.	D6 Inv.
	Inventive Examples-Compositions.					
INORGANIC RAW Pressure Drop (kPa) at 5 g/L Soot Loading, 26.25 scfm flow rate	—	—	7.3	6.7	6.6	6.1
Permeability (10^{-12} m^2)	1.56	2.63	1.28	1.20	1.33	1.50
Percent Porosity	52.4	52.1	49.4	—	—	—
Median Pore Size (μm)	19.2	22.5	14.7	—	—	—
Pore Volume (cm^3/g)	0.4191	0.4143	0.3907	0.2972	0.3551	0.3498
Volume of pores with diameters larger than indicated pore size (ml/g)						
1 μm	0.4079	0.4077	0.3859	0.2967	0.3538	0.3471
2 μm	0.4079	0.4077	0.3843	0.2956	0.3522	0.3457
4 μm	0.4079	0.4077	0.3790	0.2925	0.3476	0.3417
10 μm	0.3708	0.3956	0.3230	0.2733	0.3014	0.2993
20 μm	0.1886	0.2612	0.1210	0.1039	0.1095	0.1300
40 μm	0.0449	0.0545	0.0330	0.0230	0.0262	0.0279
60 μm	0.0251	0.0301	0.0190	0.0134	0.0157	0.0165
80 μm	0.0180	0.0211	0.0130	0.0095	0.0113	0.0116
100 μm	0.0131	0.0151	0.0100	0.0076	0.0091	0.0090
120 μm	0.0108	0.0117	0.0070	0.0060	0.0071	0.0072
140 μm	0.0085	0.0092	0.0050	0.0043	0.0052	0.0052
4–40 μm as percent of total pore	86.6	85.3	86.6	90.7	90.5	89.7
Computed value of P parameter	27.2	29.1	26.4	24.9	26.2	26.4

What is claimed is:

1. A ceramic comprising predominately a cordierite-type phase approximating the stoichiometry $Mg_2Al_4Si_5O_{18}$ and having a coefficient of thermal expansion (25–800° C.) of greater than 4×10^{-7}/° C. and less than 13×10^{-7}/° C. and a permeability and a pore size distribution which satisfy the relation 2.108 (permeability)+18.511 (total pore volume)+0.1863 (percentage of total pore volume comprised of pores between 4 and 40 micrometers)>24.6.

2. The structure of claim 1 wherein the permeability is at least 0.70×10^{-12} m^2.

3. The structure of claim 2 wherein the permeability is at least 1.0×10^{-12} m^2.

4. The structure of claim 3 wherein the permeability is at least 1.5x10-12 m^2.

5. The structure of claim 4 wherein the permeability is at least 2.0×10^{-12} m^2.

6. The structure of claim 1 wherein the total pore volume is at least 0.25 ml/g.

7. The structure of claim 6 wherein the total pore volume is at least 0.30 ml/g.

8. The structure of claim 7 wherein the total pore volume is at least 0.35 ml/g.

9. The structure of claim 1 wherein the percentage of total pore volume comprised of pores between 4 and 40 micrometers is at least 85%.

10. The structure of claim 9 wherein the percentage of total pore volume comprised of pores between 4 and 40 micrometers is at least 90%.

11. The structure of claim 1 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $10\times10^{-7}/°$ C.

12. The structure of claim 11 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $8\times10^{-7}/°$ C.

13. The structure of claim 12 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $6\times10^{-7}/°$ C.

14. The structure of claim 1 wherein the structure is used for filtering particulates from diesel engine exhaust.

15. A diesel particulate filter comprising a cordierite body having a CTE (25–800° C.) of greater than $4\times10^{-7}/°$ C. and less than $13\times10^{-7}/°$ C., a bulk filter density of at least 0.60 g/cm^3, and a pressure drop in Kpa across the filter of less than 8.9–0.035 (number of cells per square inch)+300 (cell wall thickness in inches) at an artificial carbon soot loading of 5 grams/liter and a flow rate of 26 scfm, wherein the filter has the shape of a honeycomb, the honeycomb having an inlet end and an outlet end, and a multiplicity of cells extending from the inlet end to the outlet end, the cells having porous walls, wherein part of the total number of cells at the inlet end are plugged along a portion of their lengths, and the remaining part of cells that are open at the inlet end are plugged at the outlet end along a portion of their lengths, so that an engine exhaust stream passing through the cells of the honeycomb from the inlet end to the outlet end flows into the open cells, through the cell walls, and out of the structure through the open cells at the outlet end.

16. The diesel particulate filter of claim 15 wherein the pressure drop is less than 12.9 kPa at an artificial carbon soot loading of 5 grams/liter and a flow rate of 26.65 scfm for a cell density of 100 cells per square inch and a cell wall thickness of about 0.025 inches.

17. The diesel particulate filter of claim 15 wherein the pressure drop is less than 7.9 kPa at an artificial carbon soot loading of 5 grams/liter and a flow rate of 26.65 scfm for a cell density of about 200 cells per square inch and a cell wall thickness of about 0.020 inches.

18. The diesel particulate filter of claim 15 wherein the bulk filter density is 0.68 g/cm^3.

19. The diesel particulate filter of claim 18 wherein the bulk filter density is 0.77 g/cm^3.

20. The filter of claim 15 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $10\times10^{-7}/°$ C.

21. The filter of claim 20 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $8\times10^{-7}/°$ C.

22. The filter of claim 21 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $6\times10^{-7}/°$ C.

23. A wall-flow filter comprising a cordierite body having a CTE (25–800° C.) of greater than $4\times10^{-7}/°$ C. and less than $13\times10^{-7}/°$ C., a permeability and a pore size distribution which satisfy the relation 2.108 (permeability)+18.511 (total pore volume)+0.1863 (percentage of total pore volume comprised of pores between 4 and 40 micrometers)>24.6, such that at an artificial carbon soot loading of 5 grams/liter and a flow rate of 26 scfm, the filter has a pressure drop in kPa across the filter of less than 8.9–0.035 (number of cells per square inch)+300 (cell wall thickness in inches), wherein the filter has a bulk filter density of at least 0.60 g/cm^3, wherein the filter has the shape of a honeycomb, the honeycomb having an inlet end and an outlet end, and a multiplicity of cells extending from the inlet end to the outlet end, the cells having porous walls, wherein part of the total

number of cells at the inlet end are plugged along a portion of their lengths, and the remaining part of cells that are open at the inlet end are plugged at the outlet end along a portion of their lengths, so that an engine exhaust stream passing through the cells of the honeycomb from the inlet end to the outlet end flows into the open cells, through the cell walls, and out of the structure through the open cells at the outlet end.

24. The filter of claim 23 further having a volumetric heat capacity of at least 0.67 J cm^{-3} K^{-1} as measured at 500° C.

25. The filter of claim 24 wherein the volumetric heat capacity is at least 0.76 J cm^{-3} K^{-1} as measured at 500° C.

26. The filter of claim 25 wherein the volumetric heat capacity is at least 0.85 J cm^{-3} K^{-1} as measured at 500° C.

27. The filter of claim 24 wherein the permeability is at least 0.70×10^{-12} m^2.

28. The filter of claim 24 wherein the permeability is at least 1.0×10^{-12} m^2.

29. The filter of claim 28 wherein the permeability is at least 1.5×10^{-12} m^2.

30. The filter of claim 29 wherein the permeability is at least 2.0×10^{-12} m^2.

31. The filter of claim 24 wherein the total pore volume is at least 0.25 ml/g.

32. The filter of claim 31 wherein the total pore volume is at least 0.30 ml/g.

33. The filter of claim 32 wherein the total pore volume is at least 0.35 ml/g.

34. The filter of claim 24 wherein the percentage of total pore volume comprised of pores between 4 and 40 micrometers is at least 85%.

35. The filter of claim 34 wherein the percentage of total pore volume comprised of pores between 4 and 40 micrometers is at least 90%.

36. The filter of claim 24 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $10\times10^{-7}/°$ C.

37. The filter of claim 36 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $8\times10^{-7}/°$ C.

38. The filter of claim 37 wherein the coefficient of thermal expansion (25–800° C.) is greater than $4\times10^{-7}/°$ C. and less than $6\times10^{-7}/°$ C.

39. The filter of claim 24 wherein the pressure drop is less than 12.9 kPa at an artificial carbon soot loading of 5 grams/liter and a flow rate of 26.65 scfm for a cell density of 100 cells per square inch and a cell wall thickness of about 0.025 inches.

40. The filter of claim 24 wherein the pressure drop is less than 7.9 kPa at an artificial carbon soot loading of 5 grams/liter and a flow rate of 26.65 scfm for a cell density of about 200 cells per square inch and a cell wall thickness of about 0.020 inches.

41. A method of making a cordierite body comprising:

a) forming a mixture of raw materials which include:
   - a talc source having a morphology index greater than about 0.75 and an average particle size greater than 15 micrometers but less than 35 micrometers;
   - an alumina source having an median particle size between 4.6 and 25 micrometers;
   - a silica source having a median particle size between 10 and 35 micrometers;

b) shaping the mixture into a green structure;

c) firing the green structure to produce a fired structure comprising predominantly a cordierite-type phase

approximating the stoichiometry $Mg_2Al_4Si_5O_{18}$ and having a coefficient of thermal expansion (25–800° C.) of greater than $4\times10^{-7}/°$ C. and less than $13\times10^{-7}/°$ C. and a permeability and a pore size distribution which satisfy the relation 2.108 (permeability)+18.511 (total pore volume)+0.1863(percentage of total pore volume comprised of pores between 4 and 40 micrometers) >24.6.

42. The method of claim **41** wherein the raw materials further include kaolin in an amount of not more than the quantity (in weight percentage) given by the equation 4.0 (median particle size of the alumina source)−18.4.

43. The method of claim **41** wherein the talc source has a median particle size of between 25 and 35 micrometers.

44. The method of claim **41** wherein the alumina source is selected from the group consisting of alpha-alumina, gamma-alumina, rho-alumina, boehmite, aluminum hydroxide and combinations thereof.

45. The method of claim **44** wherein the alumina source comprises at least 10 percent based on raw material weight aluminum hydroxide.

46. The method of claim **41** wherein the talc source has a median particle size of 18–30 micrometers and the alumina source has a median particle size of 7 to 15 micrometers.

47. The method of claim **41** wherein the silica source is selected from the group consisting of quartz, cristobalite, fused silica, sol-gel silica, zeolite, diatomaceous silica, and combinations thereof.

48. The method of claim **41** wherein the mixture is shaped by extrusion.

49. The method of claim **41** wherein the green structure is fired to a maximum temperature of 1405–1430° C., at a rate of between 15 and 100° C./hour, with a hold at the maximum temperature of between 6 to 25 hours.